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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/672,346	09/26/2003	Joon-Seo Son	11948.12	9664

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EXAMINER

IM, JUNGHWA M

ART UNIT PAPER NUMBER

2811

DATE MAILED: 07/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/672,346

Applicant(s)

SON ET AL.

Examiner

Junghwa M. Im

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 April 2006.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-4, 6-9, 11-17, 19-23 and 25-27 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-4, 6-9, 11-17, 19-23 and 25-27 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 26 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 18 April 2006 has been entered.

Priority

2. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Republic of Korea on 27 September 2002. It is noted, however, that applicant has not filed a certified copy of the 2002-58857 application as required by 35 U.S.C. 119(b).

Claim Objections

3. Claims are objected to because of the following informalities:

in claim 1, line 6, replace "a first and second" with -- a first and a second --.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Art Unit: 2811

5. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites a limitation of “wherein the lead frame pad contacts the ceramic layer by only using the molding material,” implying as if the lead frame pad is attached to the ceramic layer only by an epoxy adhesive (molding material), not by an solderable adhesive. Based on the disclosure of the instant invention, however, it appears that the claim is recited to state that the molding material (plastic package) surrounding the lead frame pad and the ceramic layer holds them together without using an adhesive.

Claims 15 ad 19 recite a limitation substantially identical to claim 1.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-3, 6-8, 11-17, 19-23 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wakefield (US 5598034) in view of Lin (US 5216283).

Regarding claims 1 and 6, Fig. 1 of Wakefield shows a discrete package comprising:

a lead frame pad [11] which has a first surface and a second surface, the second surface

which is the opposite surface of the first surface;

leads [20 in Fig. 2] connected to a side of the lead frame pad;

Art Unit: 2811

a semiconductor chip [36] attached to the first surface of the lead frame pad;
a ceramic layer [10; column 5, lines 18-34] having a first and second surface and which is positioned directly to the second surface of the lead frame pad; and
a molding material [14] which entirely encapsulates the lead frame pad, the semiconductor chip, and a portion of the ceramic layer, except the leads and the second surface of the ceramic layer.

Fig. 1 of Wakefield shows most aspects of the instant invention except that the lead frame pad directly contacts the ceramic layer by only using the molding material. Fig. 2-a of Lin shows the lead frame pad [20 in Fig. 1-b] directly contacts the ceramic layer [14; column 4, lines 6-12] by only using the molding material [12] (column 4, lines 65-68).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Lin into the device of Wakefield in order to have the lead frame pad directly contacting the ceramic layer without an adhesive for better heat transfer.

Regarding claims 2 and 7, Fig. 1 of Wakefield shows that the leads are stepped with respect to the lead frame pad.

Regarding claims 3 and 8, Wakefield discloses that the discrete package further comprising wires which electrically connect the leads to the semiconductor chip (column 4, lines 32-36).

Regarding claims 11 and 14, Fig. 1 of Wakefield shows a discrete package comprising:
a lead frame [11] having a first surface and a second surface with a lead connected to the lead frame;
a semiconductor chip [13] attached to the first surface of the lead frame; and

a ceramic layer [10; col. 5, lines 18-33] having a first surface and a second surface, wherein the first surface of the ceramic layer is attached to the second surface of the lead frame;

a molding material [14] which encapsulates the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface.

Fig. 1 of Wakefield shows most aspects of the instant invention except that the first surface of the ceramic layer contacts the second surface of the lead frame without using an adhesive. Fig. 2-a of Lin shows that the first surface of the ceramic layer [14; column 4, lines 6-12] contacts the second surface of the lead frame [20 in Fig. 1-b] (column 4, lines 65-68).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Lin into the device of Wakefield in order to have the lead frame pad directly contacting the ceramic layer for better heat transfer.

Regarding claim 12, Fig. 2-b of Lin shows that the first surface of the ceramic layer does not contain a conductive layer.

Regarding claim 13, Fig. 2-b of Lin discloses that the semiconductor chip is attached to the first surface of the lead frame using an adhesive (column 4, lines 32-35).

Regarding claim 15, Fig. 1 of Wakefield shows an electronic apparatus containing a packaged semiconductor device, the device comprising:

a lead frame [11] having a first surface and a second surface with a lead connected to the lead frame;

a semiconductor chip [13] attached to the first surface of the lead frame;

Art Unit: 2811

a ceramic layer [10; col. 5, lines 18-33] having a first surface and a second surface wherein the first surface of the ceramic does not contain a conductive layer and is attached to the second surface of the lead frame; and

a molding material [14] which encapsulates the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface.

Fig. 1 of Wakefield shows most aspects of the instant invention except that the lead frame pad directly contacts the ceramic layer using only the molding material. Fig. 2-a of Lin shows the lead frame pad [20 in Fig. 1-b] directly contacts the ceramic layer [14; column 4, lines 6-12] by only using the molding material [12] (column 4, lines 65-68).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Lin into the device of Wakefield in order to have the lead frame pad directly contacting the ceramic layer without an adhesive for better heat transfer.

Regarding claim 16, Fig. 2-b of Lin shows that the first surface of the ceramic layer is directly contacts the second surface of the lead frame.

Regarding claim 17, Fig. 2-b of Lin shows that the first surface of the ceramic layer does not contain a conductive layer.

Regarding claim 19, Fig. 1 of Wakefield shows a packaged semiconductor device inherently made by a method comprising:

providing a lead frame [11] having a first surface and a second surface with a lead connected to the lead frame;

providing a semiconductor chip [13] attached to the first surface of the lead frame;

providing a ceramic layer [10; col. 5, lines 18-33] having a first surface and a second

Art Unit: 2811

surface, wherein the first surface of the ceramic does not contain a conductive layer and is attached to the second surface of the lead frame; and

providing a molding material [14] which encapsulates the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface.

Fig. 1 of Wakefield shows a device formed with most aspects of the instant invention except that the lead frame pad directly contacts the ceramic layer only by the molding material. Fig. 2-a of Lin shows the lead frame pad [20 in Fig. 1-b] directly contacts the ceramic layer [14; column 4, lines 6-12] by only the molding material [12] (column 4, lines 65-68).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Lin into the device of Wakefield in order to have the lead frame pad directly contacting the ceramic layer without an adhesive for better heat transfer.

Regarding claim 26, Fig. 2-b of Lin shows that the first surface of the ceramic layer does not contain a conductive layer.

Regarding claim 20, Fig. 1 of Wakefield shows a packaged semiconductor device made by a method comprising:

providing a lead frame [11] having a first surface and a second surface with a lead connected to the lead frame;

attaching a semiconductor chip [13] attached to the first surface of the lead frame;

attaching a first surface of a ceramic layer [10; col. 5, lines 18-33] to the second surface of the lead frame, wherein the first surface of the ceramic does not contain a conductive layer and is attached to the second surface of the lead frame; and

encapsulating with a molding material [14] the lead frame the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface.

Fig. 1 of Wakefield shows a device formed with most aspects of the instant invention except that the first surface of the ceramic layer contacts the second surface of the lead frame pad by encapsulating the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface. Fig. 2-a of Lin shows the lead frame pad [20 in Fig. 1-b] directly contacts the ceramic layer [14; column 4, lines 6-12] by encapsulating the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface with molding material [12] (column 4, lines 65-68).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Lin into the device of Wakefield in order to have the lead frame pad contacting the ceramic layer by encapsulating the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface with the molding material for better heat transfer.

Regarding claim 21, Fig. 2-b of Lin shows that the first surface of the ceramic layer is directly contacts the second surface of the lead frame.

Regarding claim 22, Fig. 1 of Wakefield shows a packaged semiconductor device made with a method wherein the encapsulation is performed using a molding material [14].

Regarding claim 23, Fig. 2-b of Lin shows that the first surface of the ceramic layer does not contain a conductive layer.

Art Unit: 2811

8. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wakefield in view of Lin and Shinohara (US 6979909).

Regarding claim 25, Fig. 1 of Wakefield shows an electronic apparatus made by a method comprising:

providing a packaged semiconductor device by providing a lead frame [11] having a first surface and a second surface with a lead connected to the lead frame,

attaching a semiconductor chip [13] attached to the first surface of the lead frame;

attaching a first surface of a ceramic layer [10; col. 5, lines 18-33] to the second surface of the lead frame, and

encapsulating with a molding material [14] the lead frame the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface.

Wakefield shows most aspects of the instant invention, however, fails to show an electronic apparatus made by a method of providing the first surface of the ceramic layer contacting the second surface of the lead frame pad by encapsulating the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface and providing an outer heat sink connected to the packaged semiconductor device.

Fig. 2-a of Lin shows the lead frame pad [20 in Fig. 1-b] directly contacts the ceramic layer [14; column 4, lines 6-12] by encapsulating the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface with molding material [12] (column 4, lines 65-68).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Lin into the device of Wakefield in order to have the

Art Unit: 2811

lead frame pad directly contacting the ceramic layer by encapsulating with the molding material for better heat transfer.

The combined teachings of Wakefield/Lin fail to show a method of providing an outer heat sink. Fig. 1 of Shinohara shows an outer heat sink [11] connected to the packaged semiconductor device.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Shinohara into the device of Wakefield/Lin in order to provide an outer heat sink connected to the packaged semiconductor device to increase the heat dissipation.

Regarding claim 27, Fig. 2-b of Lin shows that the first surface of the ceramic layer does not contain a conductive layer.

9. Claims 4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wakefield in view of Lin as applied to claims 1 and 6 above, and further in view of Nakanishi et al. (US 6501156), hereinafter Nakanishi.

Regarding claims 4 and 9, the combined teachings of Wakefield/Lin show substantially the entire claimed structure except “the lead frame pad is formed to a thickness of 0.5 mm.” Nakanishi discloses the lead frame pad with a thickness range of 0.5-0.7 mm (column 5, line 21).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Nakanishi into the device of Wakefield/Lin in order to have to the lead frame pad with a thickness of 0.5 mm to accommodate the manufacturing specification.

Response to Arguments

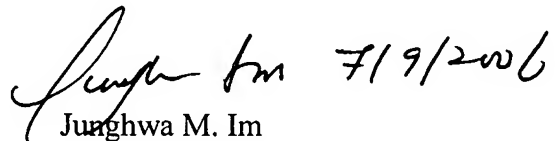
10. Applicant's arguments with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Junghwa M. Im
Examiner
Art Unit 2811

jmi